

Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method

1. Scope:

This test is for determining air content in fresh concrete by the pressure method.

2. Apparatus:

- 2.1 Air meter conforming to AASHTO T 152. (Type B)
- 2.2 Tamping rod. A round smooth straight 5/8 in. diameter steel rod with the tamping end or both ends rounded to a hemispherical tip of 5/8 in. diameter. The minimum length shall be 18 in.
- 2.3 Mallet. A mallet (with a rubber or rawhide head) having a mass of 1.25 +/- 0.50 lb.
- 2.4 Strike-Off Plate. A flat rectangular metal plate at least 1/4 in. thick or a glass or acrylic plate at least 1/2 in. thick with a length and width at least 2 in. greater than the diameter of the measure with which it is to be used. The edges of the plate shall be straight and smooth within a tolerance of 1/16 in.
- 2.5 Scoop. A scoop of a size large enough so a representative amount of concrete is obtained and small enough that concrete is not spilled during placement in the measure.
- 2.6 Strike-Off Bar. A flat straight bar of steel at least 1/8 in. thick and 3/4 in. wide by 12 in. long.

3. Procedure:

- 3.1 Air Meter Calibration – Method A.
 - A. Fill the measuring bowl with water.
 - B. Screw the short piece of straight tubing into the threaded petcock hole on the underside of the cover. Clamp the cover assembly onto the measuring bowl with the tube extending down into the water.
 - C. With both petcocks open, add water with a syringe through the petcock having the pipe extension below, until all the air is forced out the opposite petcock. Leave both petcocks open.
 - D. Pump the pressure to a little beyond the initial calibration pressure. This initial calibration pressure is read on the scale below “% air” in the lower right-hand corner of the gauge. A good starting point for this initial calibration pressure is 3.0%. Wait a few seconds for compressed air to cool to normal temperature and then stabilize the gauge needle

at the initial calibration pressure by pumping or bleeding off as needed. It will be necessary to tap the gauge lightly several times with your finger to stabilize the needle.

- E. Close both petcocks and immediately press down on the thumb lever exhausting the air into the measuring bowl. Wait a few seconds until the hand is stabilized. Lightly tap the gauge with your finger to stabilize the needle. If all the air was eliminated and the initial calibration pressure was correctly selected, the gauge should read zero. If two or more tests show a consistent variation of $\pm 0.1\%$ in the result, then change the initial calibration pressure to compensate for the variation. Use the newly established initial calibration pressure for subsequent tests. The initial calibration pressure should be marked on the gauge for reference on subsequent tests.
- F. Screw the curved tube into the outer end of the petcock and by pressing on the thumb lever and controlling the flow with the petcock lever, fill the 5% calibration vessel level full of water from the meter. The 5% of water may also be determined by weight.
- G. Release the air at the free petcock. Open the other petcock and let the water in the curved pipe run back into the measuring bowl. There is now the equivalent of 5% air in the measuring bowl.
- H. With the petcocks open, pump up the air pressure in the same manner as outlined in paragraph D. Close the petcocks and immediately press the thumb lever. Wait a few seconds for exhaust air to warm to normal temperature, and for the needle to stabilize.

Tap the gauge lightly again with your finger to aid in stabilizing the needle. The dial should read 5.0%.
- I. If two or more consecutive readings are more than 0.1% above or below 5%, remove the gauge glass and reset the needle to 5% by turning the re-calibration screw located on the needle assembly. If the re-calibration screw is adjusted, the initial pressure must be checked again. If the initial pressure changes, then the 5% reading should also be rechecked.
- J. Once you have calibrated the meter at 5%, you may calibrate for higher air contents, if deemed necessary. This is accomplished by withdrawing additional water at 5% increments using the calibration vessel or at other values by weight and repeating the steps outlined in paragraphs G., H., and I. above.

3.2 Air Meter Calibration – Method B (Field Check Only)

- A. Fill the measuring bowl with water.
- B. Place the internal calibration cylinder at the bottom of the filled measuring bowl. (Keep the cylinder upright as you place it.)
- C. Clamp the cover assembly on the measuring bowl.
- D. With both petcocks open, add water with a syringe through one petcock until all air is forced out and water emerges from the opposite petcock. Leave both petcocks open.
- E. Pump the pressure to a little beyond the initial calibration pressure that is marked on the gauge. Wait a few seconds for compressed air to cool to normal temperature and then stabilize the gauge needle at that pressure by pumping or bleeding off as necessary while tapping the gauge lightly with your finger.
- F. Close both petcocks and immediately press down on the thumb lever exhausting the air into the base. Lightly tap the gauge with your finger and wait a few seconds until the hand is stabilized. If the gauge is calibrated correctly, the gauge should read 5.0%. If two or more tests show a consistent variation greater than $\pm 0.1\%$ in the result, the air meter should be calibrated as per Method A at the earliest convenience.
- G. Keep the small hole at the bottom of the internal calibration cylinder unobstructed. Usually a very slight amount of water may be left in the cylinder after a test. Shake this water out before making another test or putting the internal calibration cylinder into storage. Use two internal calibration cylinders if you wish to calibrate at 10%.

3.3 Air test: Type B meter.

- A. Obtain a sample of fresh concrete in accordance with SD 402.

NOTE: Samples of volumetric mixed low slump dense concrete shall be placed in a covered container for 5 minutes prior to testing.
- B. Dampen the interior of the empty measuring bowl and remove any standing water from the bottom. Place the measuring bowl on a flat, level and firm surface.
- C. Fill the measuring bowl with concrete in 3 approximately equal layers. Rod each layer 25 times. Distribute the strokes uniformly over the cross section of the layer being rodded.

Rod the lower layer throughout its depth, but the rod shall not forcibly strike the bottom of the measuring bowl so as to cause excessive vibration. Rod the second and third layers with the rod penetrating slightly (Approximately 1 inch) into the layer below.

Add concrete to the final layer in a manner to avoid excessive overfilling. Add additional concrete as required to keep the surface above the-measuring bowl as it is rodded.

After each layer is rodded, tap the outside of the measuring bowl 10 to 15 times with the mallet. Tap with enough force to close any holes left by rodding and to release any large air bubbles that may have been trapped. For concrete with a slump of less than 2" the number of taps can be increased to achieve consolidation.

- D. Use a strike-off bar or strike-off plate to strike off the concrete flush with the top of the measuring bowl. Strike off the top surface of the measuring bowl with the strike-off bar in a sawing motion until the bowl is level full. Removal of 1/8" of material during strike off is optimum. Use the following procedure for striking off the measure with a strike-off plate:

Press the strike-off plate on top of the measuring bowl to cover approximately 2/3 of the measuring bowl. Withdraw the strike-off plate with a sawing motion. Place the strike-off plate on the measuring bowl in the original position to cover the same 2/3 of the measuring bowl. Advance the strike-off plate with downward pressure and a sawing motion until it slides completely off the measuring bowl. Finish the surface with several strokes of the strike-off plate at an inclined angle.

NOTE: Strike-off plate shall be used for strike off on all unit weight determinations.

- E. Thoroughly clean the rim of the measuring bowl. The internal surface of the cover assembly and seal must be clean and should be wet prior to placing it on the measuring bowl. Clamp the cover assembly on securely, leave the petcocks open.
- F. Using the syringe supplied, inject water through one petcock until all of the air is displaced and expelled through the opposite petcock. Leave both petcocks open at this time. Jar the meter gently with the hand to expel trapped air.
- G. Apply air pressure with the pump until the gauge reading equals the initial calibration pressure that is marked on the gauge.
- H. Wait a few seconds and stabilize the needle at the initial calibration pressure by pumping up or bleeding off with the air release valve, while tapping the gauge to ensure the needle is stabilized.

Close both petcocks then press down on the thumb lever to release the air into the measuring bowl. While holding the thumb lever down smartly tap the measuring bowl with a mallet to relieve local restraints and then lightly tap the gauge with your finger to stabilize the needle.

- I. Read the percent of air in the concrete on the dial and then release the thumb lever.
- J. Release the pressure in the measuring bowl by opening the petcocks. Clean the measuring bowl and the cover assembly thoroughly with running water.

20

4. Report:

Report the percent of air to the nearest 0.1% on a DOT-23.

5. References:

AASHTO T 152
SD 402
DOT-23